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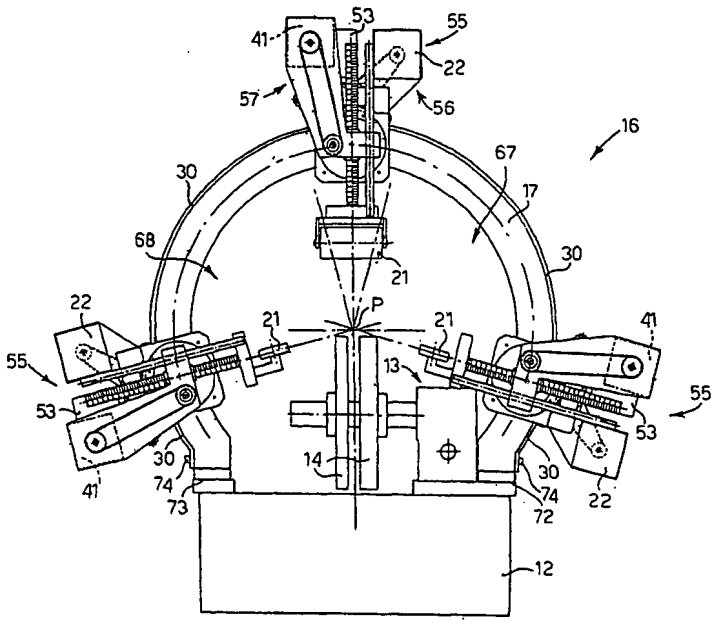
(54) **Title:** APPARATUS FOR COVERING AN OBJECT SUCH AS A PROFILED ELEMENT, A PANEL OR SUCHLIKE



(57) **Abstract:** Apparatus for covering an object, such as for example a profiled element, comprising a base (12) for the object, a guide device (13) and a plurality of work stations (16), each one provided with a support (17) on which one or more tools (21) are mounted. Each work station (16) comprises an automatic adjustment device (55) to adjust the position of each tool (21). Moreover, the support (17) is shaped so as to allow all the tools (21) to be arranged both in a work position and also in a service zone (67) opposite the access zone (68) for the operator.

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"APPARATUS FOR COVERING AN OBJECT SUCH AS A PROFILED ELEMENT, A PANEL OR SUCHLIKE"

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FIELD OF THE INVENTION

The present invention concerns an apparatus for covering or enhancing, for example by means of veneering, an object such as a profiled element, a panel or suchlike, made of any material whatsoever, such as wood, metal or other. The apparatus comprises a base on which guide means are mounted in order to guide the object to be covered, a device to arrange the covering material on said object, and a plurality of work stations, separated from each other, each of which is provided with at least one tool. Each tool is able to press the covering material onto the object to be covered, so that said covering material adheres to the object, whatever the shape of the object might be.

BACKGROUND OF THE INVENTION

An apparatus for covering objects is known, which comprises a base on which guide rollers are mounted in order to guide, along a reference plane, the object to be covered, the latter normally consisting of a wooden profiled element to be enhanced by means of applying a plastic material.

A device, arranged upstream of the guide rollers, is able to arrange the covering material on the object to be covered, in the form of a strip, the latter unwinding from a feed roller, with a glue being interposed.

One or more work stations are mounted along the reference plane at a determinate distance from each other, in order to press the covering material against the object to be covered so that the latter is irremovably glued.

Each work station comprises a support on which one or more tools are mounted, consisting of pressure rollers,

each of which is shaped according to the part of the object on which it has to exert its thrust action, in order to keep the covering material pressed against the object.

The position of each tool with respect to the support can be adjusted and clamped manually by means of a clamp.

Before each working cycle, the tools of the whole apparatus, of which there may be several dozen, must therefore be positioned individually and precisely so that, in use, they press the covering material allowing the correct adhesion thereof to the object to be covered, while the glue dries and becomes effective.

The above known apparatus has the disadvantage that it provides that all the tools are adjusted manually by an expert operator, which entails a great deal of time, from one hour to about an hour and a half; it also entails the possibility of errors in positioning one or more tools, with the consequent malfunctioning of the apparatus and defects in the finished product.

Moreover, according to the object to be covered, the tools can be very different from each other, and thus the operator has to employ even more time to select the most appropriate tools to mount.

An apparatus is also known comprising a base on which an interchangeable frame is arranged, on which a plurality of work stations are mounted. One or more tools are mounted on said work stations, each of which tools is arranged in a determinate fixed position, according to the shape of the object to be covered.

In order to be able to cover different objects having a different profile from each other, it is necessary to have a determinate number of interchangeable frames available.

The interchangeable frames have the disadvantage, however, that they are voluminous, and hence require a lot

of space so that they can be stored.

Moreover, it is necessary to use a lift truck or trolley in order to move each frame, with consequent increase in the working times and costs.

An apparatus is also known in which each work station comprises a support consisting of two vertical uprights, attached to the sides of the base, which support a horizontal cross-piece. On the two vertical uprights some horizontal arms are able to slide, on each of which a tool is mounted. The position of each tool is adjusted by means of a control unit.

This known apparatus has the disadvantage that it has particularly complex and cumbersome work stations, each of which occupies a great deal of space. Consequently, when the work stations are mounted at a standard distance from each other, they prevent the operator from performing maintenance work or repairs. On the contrary, if the work stations are mounted at a distance sufficient to allow the intervention of the operator, the whole apparatus is extremely bulky, requiring very large spaces if it is to be installed in productive sites.

One purpose of the present invention is to achieve an apparatus whose tools can be positioned automatically in the correct work position with respect to the object to be covered, during the working steps.

Another purpose of the present invention is to achieve an apparatus wherein the tools can be positioned automatically on the same side of the work station with respect to the object to be covered.

A further purpose of the present invention is to achieve an automated apparatus with regard to the adjustment of the position of the tools and their possible replacement, so that the adjustment of different tools, of which there are

sometimes even more than fifty, can be completed in a few minutes.

Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

SUMMARY OF THE INVENTION

The present invention is set forth and characterized in the main claim, while the dependent claims describe other characteristics of the present invention or variants to the main inventive idea.

In accordance with the above purposes, an apparatus according to the present invention is applied for covering an object and comprises a horizontal base, a covering device arranged upstream of the apparatus and able to arrange a covering material on the object to be covered, and a plurality of work stations.

Guide means are mounted on the base and are equipped with rollers which are able to guide the object to be covered along a reference axis.

The work stations are arranged along the reference axis and are separated from each other. Every work station comprises support means, mounted in a vertical position with respect to the base and able to support at least a tool, which is able to press the covering material against the object to be covered, following the profile thereof, so that said covering material remains glued irremovably on the object.

According to one characteristic of the present invention, each work station of the apparatus comprises automatic adjustment means to adjust the position of the tool with respect to the support means. Moreover, the latter are shaped so as to allow the tool and the relative automatic adjustment means to be arranged both in a work position, in

cooperation with the object to be covered, and also in a service zone, opposite a zone of access by an operator to said object to be covered.

According to a preferential embodiment, the support means comprise a support element, arched in shape and mounted substantially coaxial with the above reference axis.

According to a variant, the support means comprise instead two substantially vertical uprights and a substantially horizontal cross-piece.

Automatic adjustment means are mounted on the support means and comprise at least a mechanism commanded by an electric motor and a control unit of the electric motor.

According to a variant, the automatic adjustment means comprise three mechanisms for each tool and each of said mechanisms is commanded by a corresponding electric motor.

A first mechanism is able to move the tool along the path defined by the arched support element and comprises a first electric motor.

A second mechanism is able to move the tool in a radial direction to said support and comprises a second electric motor.

A third mechanism is able to incline the tool on the plane perpendicular to said reference axis and comprises a third electric motor.

A fluid-dynamic actuator is able to cooperate with the support element in order to keep the tool in the position assigned to it by the three mechanisms.

According to a variant of the present invention, at least a mechanical arm, on which a tool is mounted, is mounted on the support means. Said mechanical arm is able to adjust the position of the tool and possibly to replace it according to the profile of the object to be covered, taking it from at least a feed store, or rack, positioned

at the side of the base.

According to another variant, each work station comprises at least two autonomous supports, arranged on opposite sides with respect to the reference axis and each able to support automatic adjustment means, comprising a mechanical arm on which the tool is mounted.

By means of these automatic adjustment means and the support means, in use, it is possible to automatically position all the tools on the same side and possibly to replace each one of them in a short time, according to the shape of the object to be covered while, in the state of the art, this adjustment, and possible replacement, is performed manually by an operator, which takes a very long time.

Moreover, this automatic positioning of the tools allows an operator to access each work station from the side opposite the side where the tools are positioned, so as to perform maintenance work and possibly repairs, substantially without impediment.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other characteristics of the present invention will become apparent from the following description of a preferential form of embodiment, given as a non-restrictive example, with reference to the attached drawings wherein:

- fig. 1 is a lateral view of a covering apparatus according to the present invention;
- fig. 2 is a front view of a work station of the apparatus in fig. 1;
- fig. 3 is a lateral view, enlarged and partly in section, of a detail of the work station in fig. 2;
- fig. 4 is a first front view of the detail in fig. 3;
- fig. 5 is a second front view of the detail in fig. 3;
- fig. 6 is a block diagram that shows the connection

between the command members of fig. 2 and the numerical control means;

- fig. 7 is a front view of the apparatus in fig. 1 in an operating condition;
- fig. 8 is a front view of a variant of the apparatus in fig. 1;
- fig. 9 is a lateral view of another variant of the apparatus in fig. 1;
- fig. 10 is an isometric view of the apparatus in fig. 9;
- fig. 11 is a front view of a work station of the apparatus in fig. 9;
- fig. 12 is an isometric view of a variant of the apparatus in fig. 9;
- fig. 13 is a front view of a work station of the apparatus in fig. 12.

DETAILED DESCRIPTION OF A PREFERENTIAL FORM OF EMBODIMENT

With reference to fig. 1, an apparatus 10 according to the present invention is able to cover or enhance, for example by means of veneering, an object 11, for example a profiled element, by means of a covering material 18.

The apparatus 10 comprises a base 12, guide means 13 mounted on the base 12 and provided with guide rollers 14 in order to guide the object 11 along a reference axis P, in this case horizontal.

The apparatus 10 also comprises a device 15, arranged on the base 12 in correspondence with the guide rollers 14 and able to arrange the covering material 18 on the object 11 to be covered, by means of laying between them a glue of a known type. In this case, the device 15 comprises a container 52 containing sheets of covering material 18. According to a variant, shown by a line of dashes in fig. 1, the covering material 18 is wound on a coil 53.

On the base 12, to be more exact along the reference axis

P, a plurality of work stations 16 are mounted, suitably separated from each other. The number of work stations 16 can vary from some units to several dozen, for example from five to fifty.

Each work station 16 (fig. 2) comprises support means comprising a support element 17, arch shaped, which is mounted perpendicular to the base 12 so as to be coaxial with the reference axis P. Said support element 17 has a first side 72 attached in correspondence with a service zone 67 and a second side 73 in correspondence with an access zone 68, opposite the first.

One or more tools 21, in this case three, and the relative automatic adjustment devices 55, are mounted on the support element 17. Each of said automatic adjustment devices 55 comprises a control unit 62 and three mechanisms respectively 56, 57 and 58 (figs. 2, 3, 4, 5), each of which is driven by a corresponding electric motor 22, 41 and 53.

To be more exact, the first mechanism 56 is able to adjust the position of the tool 21 with respect to the path defined by the shape of the support element 17 and comprises an electric motor 22, mounted on a shaped plate 23, which is arranged on one side of the support element 17 (on the right in fig. 3) and is parallel to the latter. The shaped plate 23 is mounted on a guide box 24, in turn mounted on a plate 19, adjacent to the support element 17 itself.

The electric motor 22 is connected to a drive pulley 25 which, by means of a belt 26, is connected to a driven pulley 27. The latter is keyed onto a shaft 28, passing through the guide box 24 and arranged parallel to an axis X, substantially parallel to the reference axis P.

A toothed wheel 29 is keyed onto the shaft 28 (fig. 5)

and is above the support element 17, but slightly distanced from it.

The toothed wheel 29 constantly cooperates with a toothed belt 30 which rests on the support element 17 and has its ends attached to the latter, in proximity with the base 12, by means of two bolts 74. The toothed belt 30 is therefore in contact with the support element 17, except for the zone where it cooperates with the toothed wheel 29. At the sides of this zone (on the right and left in fig. 5) two grooved belt-tightener wheels 31 are mounted, which are connected by means of respective axial pins 31a to the support plate 20. The grooved belt-tightening wheels 31 are able to hold the toothed belt 30 under tension.

The toothed wheel 29 cooperates with the toothed belt 30, which stays stationary, and achieves the displacement of the tool 21 with respect to the path defined by the support element 17. To prevent the action of the mechanism 56 from causing, in use, the detachment both of the automatic adjustment devices 55 and also of the tool 21 from the support element 17, a contrasting wheel 32 is provided (fig. 3), pivoted on the plate 19 and able to press on the lower edge of the support element 17.

The second mechanism 57 instead is able to adjust the position of the tool 21 with respect to the radial direction of the support element 17. The mechanism 57 comprises the electric motor 41, mounted on a shaped plate 42, the latter being parallel to the support element 17. The shaped plate 42 is in turn fixed on a guide box 37 which is mounted on a rotary cylindrical plate 43. The latter is coupled with a support plate 20 in order to rotate with respect to the plate 20 around the axis X.

The support plate 20 is located adjacent to the support element 17 and is opposite the plate 19, to which it is

connected by means of screws.

The electric motor 41 is connected to a drive pulley 33, connected in turn to a driven pulley 34, by means of a belt 35. The driven pulley 34 is able to make a threaded coupling 64 rotate (fig. 5) inside a guide box 37 having the axis of symmetry Y substantially perpendicular to the axis X.

The threaded coupling 64 comprises an endless screw 36, keyed onto the driven pulley 34, and a nut 63 coupled with a threaded bar 38, at the lower end of which a fork 39 is connected, to which in turn the tool 21 is attached.

The nut 63, rotating, moves the threaded bar 38 in a radial direction to the support element 17, thus positioning the tool 21 at the desired distance from the object 11.

A cylindrical rod 40 is also attached to the fork 39 and is arranged parallel to the threaded bar 38 and passing through the guide box 37. The cylindrical rod 40 is able to prevent the threaded bar 38 from rotating around its axis, thus allowing it to move only in a radial direction to the support element 17.

The third mechanism 58 instead (fig. 4) is able to adjust the inclination of the tool 21 on the plane perpendicular to the reference axis P. This mechanism 58 comprises the electric motor 53, which is mounted on a shaped plate 54, in turn attached, perpendicularly to the support element 17, on the support plate 20.

The electric motor 53 is connected to a drive pulley 59, which is in turn connected by means of a belt 61 to a driven pulley 60. The latter is keyed onto an endless screw 44 which engages with a toothed sector 45. The latter is attached to the rotary cylindrical plate 43.

In order to clamp each tool 21 in the defined work

position, a fluid-dynamic actuator 46 (fig. 3) is provided, which is able to thrust a pad 65 against a wall (the one on the right in fig. 3) of the support element 17. The pad 65 is inside a seating made on the support plate 20 and is able to clamp, through friction, the group of the three mechanisms 56, 57 and 58 with respect to the support element 17.

The three electric motors 22, 41 and 53 of each automatic adjustment device 55 and the fluid-dynamic actuator 46 are controlled by means of the control unit 62 (fig. 6), which can be of any known type.

Thanks to the shape of the support element 17 and the action of the automatic adjustment devices 55, the apparatus 10 allows both to position the tool 21 automatically, during the working step, with respect to the object 11 to be covered, and also to arrange all the tools 21 in the service zone 67 (fig. 7). In this way, through the access zone 68, an operator can easily access both the object 11 to be covered and also the tools 21 and their automatic adjustment devices 55, thus performing maintenance operations or repairs, in a simple and rapid manner.

A variant of the apparatus 10 is shown in fig. 8. In this variant, each work station 116 comprises a support 117 consisting of two vertical uprights 69 and 70 and a horizontal cross-piece 71. The support 117 is mounted perpendicularly to the base 12 and, in this case, has the first upright 69 arranged in proximity with the access zone 68. The second upright 70 is located distant from the base 12, thus creating a service zone 67, inside which a tool-bearing rack 66 is arranged. The support 117 is able to support three mechanical arms 48, on each of which a tool 21 is mounted.

The mechanical arms 48 are able to move both along the cross-piece 71 and also in a direction perpendicular to the cross-piece 71, in order to bring the tool 21 as near as possible to the object 11 to be covered. Moreover, the mechanical arms 48, moving along the cross-piece 71, are able to position themselves in the service zone 67, above the rack 66. Afterwards, by means of the movement perpendicular to the cross-piece 71, the mechanical arms 48 can pick up from the rack 66 the most appropriate tools 21, according to the section of the object 11 to be covered.

When the apparatus 10 is not in use, the mechanical arms 48 are able to be positioned inside the service zone 67 and remain stationary there. In this situation, an operator can access the apparatus from the access zone 68 and perform maintenance work or repairs.

According to another variant, shown in figs. 9 to 13, each work station 216 comprises at least two autonomous supports 47, mounted in a vertical position and raised with respect to the base 12.

The supports 47 each support a mechanical arm 148, able to support and adjust the position of the tool 21 and possibly to replace the latter, picking it up from a plurality of racks 166.

Each work station 216 comprises at least a rack 166, arranged at the side of the base 12.

The rack 166 can be movable with respect to the base 12, thus allowing the mechanical arms 148 to pick up the most appropriate tool 21 from the same position.

Alternatively, the rack 166 is mounted fixed on the base 12, while the supports 47 are movable, so that the mechanical arms 148 can pick up the most appropriate tool 21 in different positions on the rack 166.

The mechanical arms 148 each comprise an H-shaped support

element 49, which is hinged on the support 47 and is able to rotate on a transverse plane perpendicular to the reference axis P.

A mobile unit 50 is hinged on the support element 49 and is able to rotate on the same plane.

A rod 51 is hinged on the mobile unit 50 and is also able to rotate on said transverse plane and on which a shaped head 52 is mounted, on which the tool 21 is mounted. The latter can thus rotate with respect to the axis of symmetry of the rod 51.

It is clear, however, that modifications and/or additions of parts may be made to the apparatus 10 as described heretofore, without departing from the field and scope of the present invention.

For example, the mechanism 56 can provide that the toothed belt 30 is attached to the support element 17 for the whole of its extension. In this case, the toothed wheel 29 engages with the toothed belt 30 without lifting it from the support element 17 and the only function of the grooved wheels 31 is to guide the movement along the path defined by the support element 17.

For example, the mechanism 57 can comprise, instead of the threaded coupling 64, a toothed bar passing through the guide box 37 and able to support the tool 21. In this case, the toothed bar can engage directly with the endless screw 36.

For example, the racks 66 and 166 can consist of a tool-bearing box, not shown in the figures, arranged parallel or perpendicular to the base 12 and able to slide on guides, so as to allow an operator, according to necessity, to replace the tools 21 contained in said box and to carry out the necessary maintenance.

It is also clear that, although the present invention has

been described with reference to some specific examples, a person of skill in the art shall certainly be able to achieve many other equivalent forms of apparatus for covering an object such as a profiled element, a panel or suchlike, having the characteristics as set forth in the claims and hence all coming within the field of protection defined thereby.

CLAIMS

1. Apparatus for covering an object such as a profiled element, a panel or suchlike, comprising a base (12) on which guide means (13) are mounted in order to guide the object to be covered (11) along a reference axis (P), a device (15) able to arrange a covering material (18) on said object to be covered (11), a plurality of work stations (16, 116, 216) arranged along said reference axis (P) and each one provided with support means (17, 47, 117) able to support at least one tool (21) able to press said covering material (18) onto said object to be covered (11), following the profile thereof, characterized in that each of said work stations (16, 116, 216) also comprises automatic adjustment means (55, 155) to adjust the position of said tool (21) with respect to said support means (17, 47, 117), and in that said support means (17, 47, 117) are shaped so as to allow said tool (21) and the relative automatic adjustment means (55, 155) to be arranged both in a work position in cooperation with said object to be covered (11), and also in a service zone (67) opposite an access zone (68) for an operator.

2. Apparatus as in claim 1, characterized in that said support means comprise a support element (17), substantially arch-shaped, arranged substantially coaxial with said reference axis (P), and in that said support element (17) is attached to said base (12) with a first side (72) in correspondence with said service zone (67) and with a second side (73) in correspondence with said access zone (68).

3. Apparatus as in claim 1, characterized in that said support means comprise a support (117) comprising two substantially vertical uprights (69, 70) and a substantially horizontal cross-piece (71), and in that one

of said uprights (69) is arranged in correspondence with said access zone (68), whereas the other of said uprights (70) is arranged in correspondence with said service zone (67).

4. Apparatus as in claim 1, characterized in that said automatic adjustment means (55) comprise at least a mechanism (56, 57, 58) commanded by an electric motor (22, 41, 53) and a control unit (62).

5. Apparatus as in claim 4, characterized in that, for each tool (21), said automatic adjustment means (55) comprise three mechanisms (56, 57, 58) each one commanded by a corresponding electric motor (22, 41, 53).

6. Apparatus as in claim 5, characterized in that a first of said mechanisms (56) is able to adjust the position of said tool (21) with respect to the path defined by said support element (17), and in that said first mechanism (56) comprises a first electric motor (22), connected to a toothed wheel (29) engaging on a toothed belt (30), having the ends attached to said support element (17).

7. Apparatus as in claim 6, characterized in that two grooved belt-tightening wheels (31) are located at the sides of said toothed wheel (29) and are able to hold said toothed belt (30) under tension, when said toothed belt (30) is in proximity with said toothed wheel (29).

8. Apparatus as in claim 6 or 7, characterized in that a contrasting wheel (32), keyed onto a plate (19), is able to press on the lower side of said support element (17) and is able to keep both said automatic adjustment means (55) and also said tool (21) constantly engaged with said support element (17).

9. Apparatus as in claim 5, characterized in that a second of said mechanisms (57) is able to adjust the position of said tool (21) with respect to the radial direction of said

support element (17), and in that said second mechanism (57) comprises a second electric motor (41) connected to a threaded coupling (64) which is able to make rotate a threaded bar (38) connected to said tool (21).

10. Apparatus as in claim 9, characterized in that said threaded coupling (64) comprises an endless screw (36) and a rotary nut (63) coupled with said threaded bar (38).

11. Apparatus as in claim 5, characterized in that a third of said mechanisms (58) is able to adjust the inclination of said tool (21) on the plane perpendicular to said reference axis (P), and in that said third mechanism (58) comprises a third electric motor (53) connected to an endless screw (44) engaged on a toothed sector (45) attached on a rotary cylindrical plate (43), which is able to rotate around an axis (X), substantially parallel to said reference axis (P).

12. Apparatus as in any claim from 5 to 11 inclusive, characterized in that a fluid-dynamic actuator (46) is able to thrust a pad (65) against said support element (17) in order to selectively clamp said tool (21) in the position assigned to said tool (21) by said three mechanisms (56, 57, 58).

13. Apparatus as in claim 3, characterized in that said support (117) is able to support at least a mechanical arm (48) on which said tool (21) is mounted.

14. Apparatus as in claim 13, characterized in that said mechanical arm (48) is able to move both along said cross-piece (71) of said support (117), and also in a direction perpendicular to said cross-piece (71).

15. Apparatus as in claim 13 or 14, characterized in that said mechanical arm (48) is able to adjust the position of said tool (21) and possibly replace said tool (21), taking it from at least a feed store (66).

16. Apparatus as in claim 15, characterized in that each of said work stations (116) comprises said feed store (66), and in that said feed store (66) is arranged on one side of said base (12) in correspondence with said service zone (67).

17. Apparatus as in claim 1, characterized in that said support means comprise at least two supports (47) arranged on opposite sides of said reference axis (P) and able to support said automatic adjustment means (155), and in that, for each support (47), said automatic adjustment means (155) comprise at least a mechanical arm (148), of a movable type, on which said tool (21) is mounted.

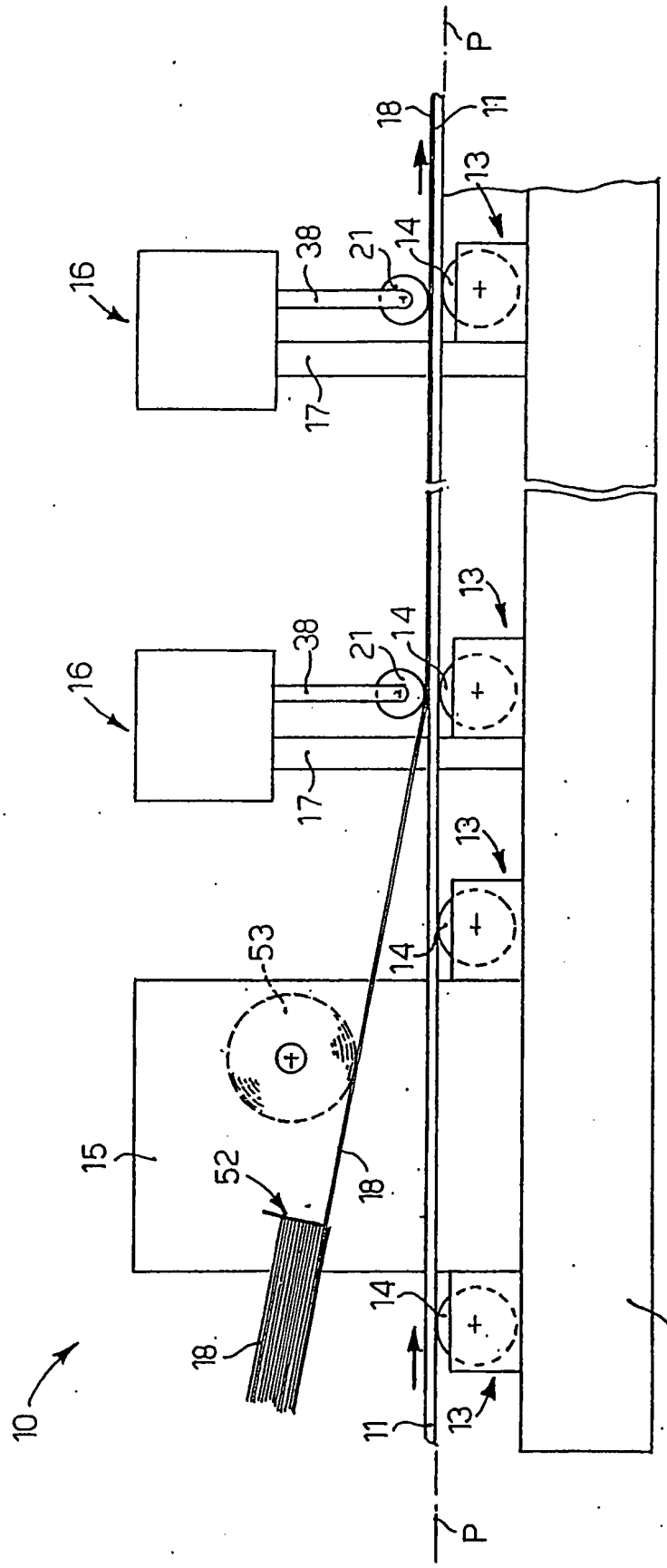

fig. 1

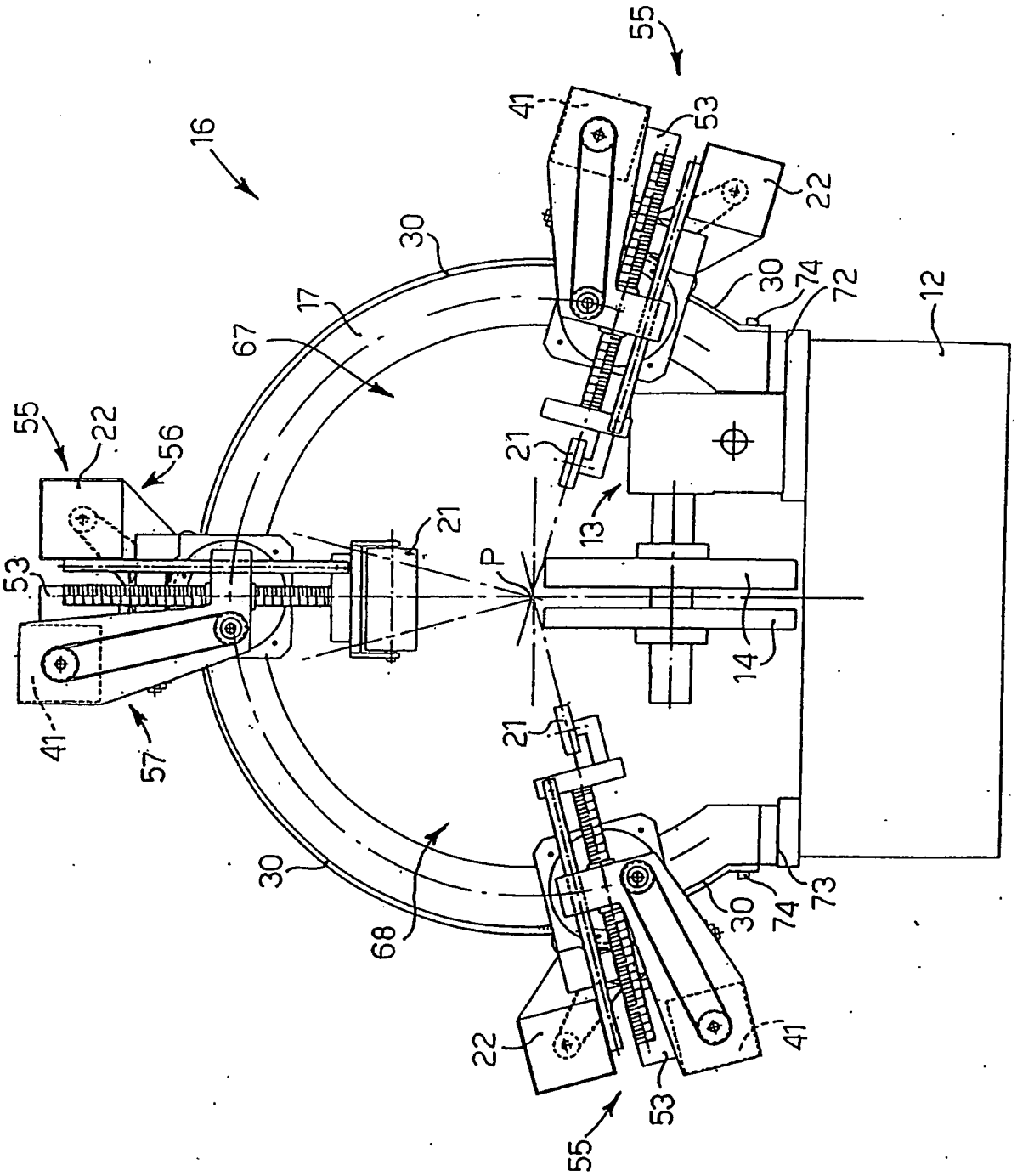
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fig. 2

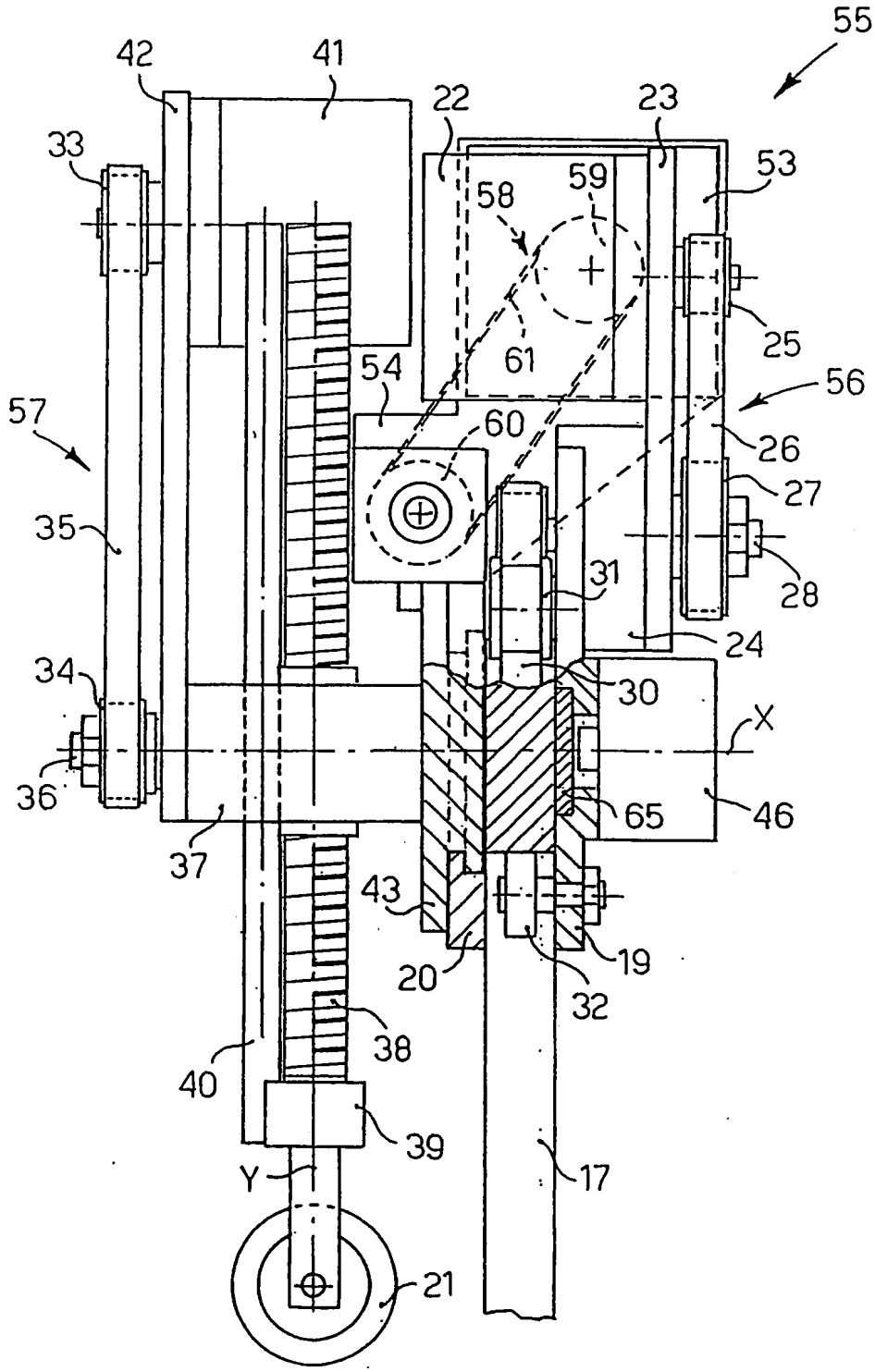
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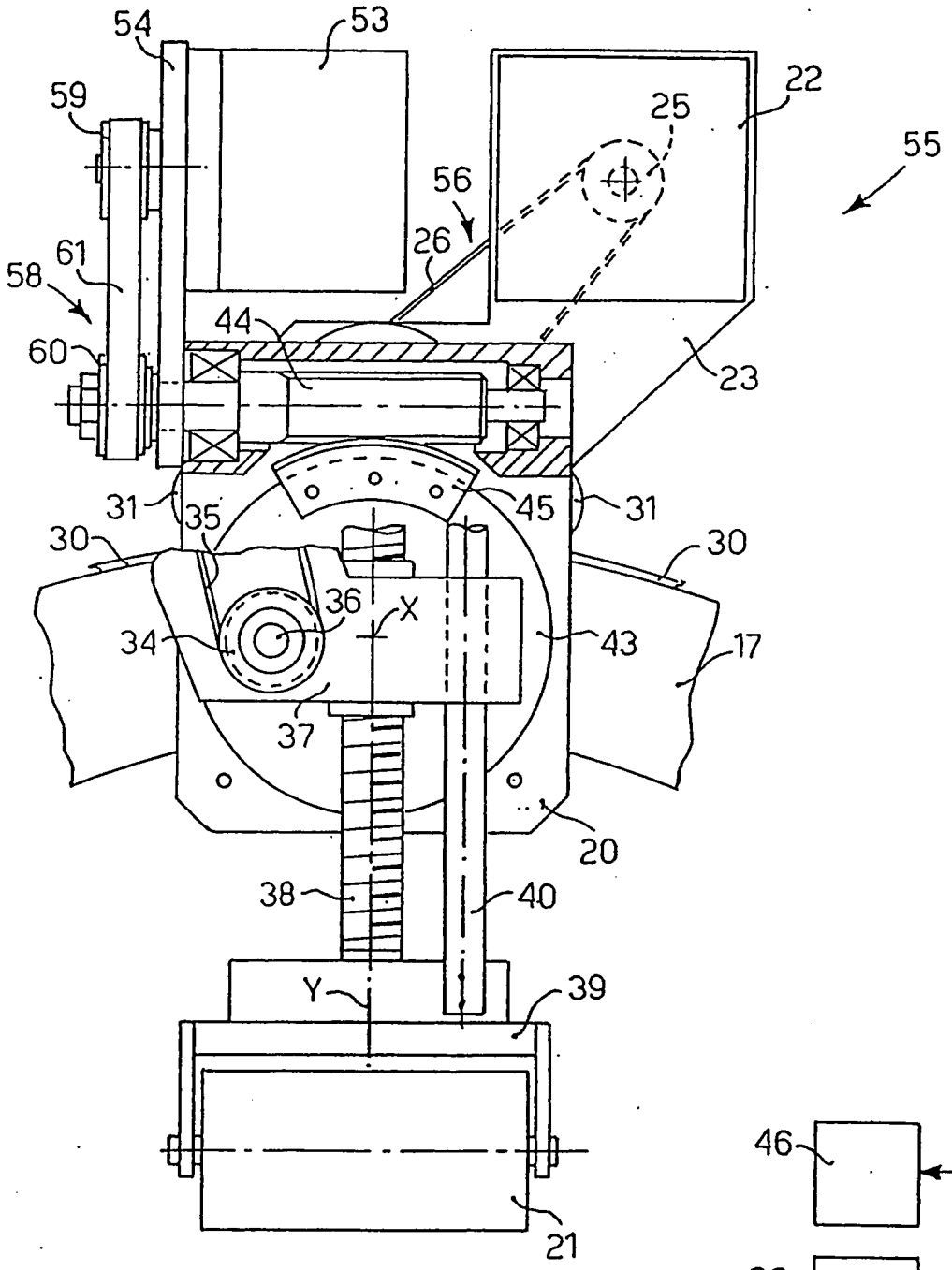
fig. 3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Y
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fig. 4

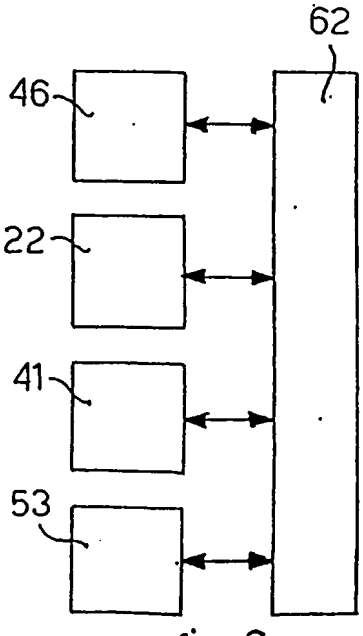
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fig. 6

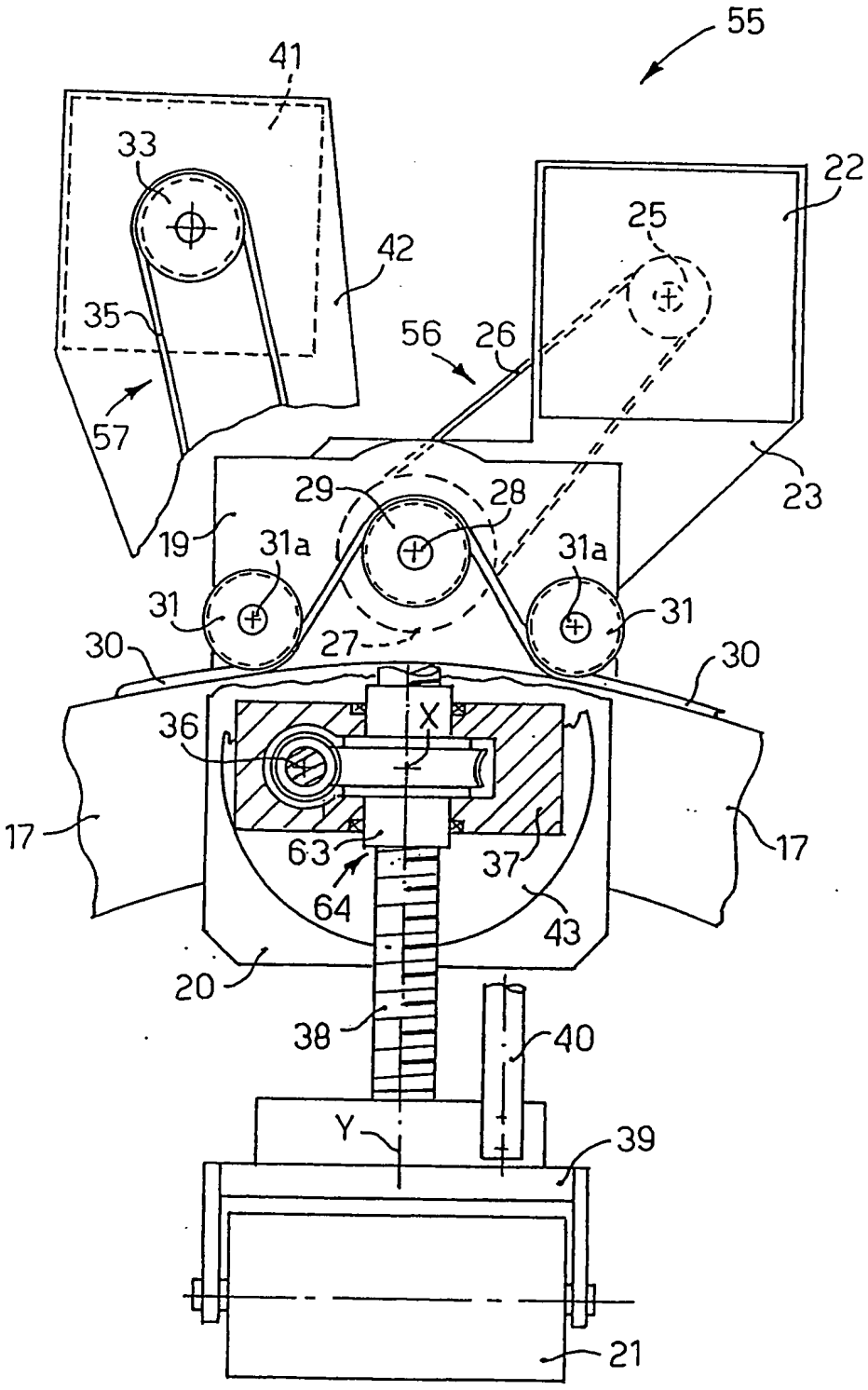
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fig. 5

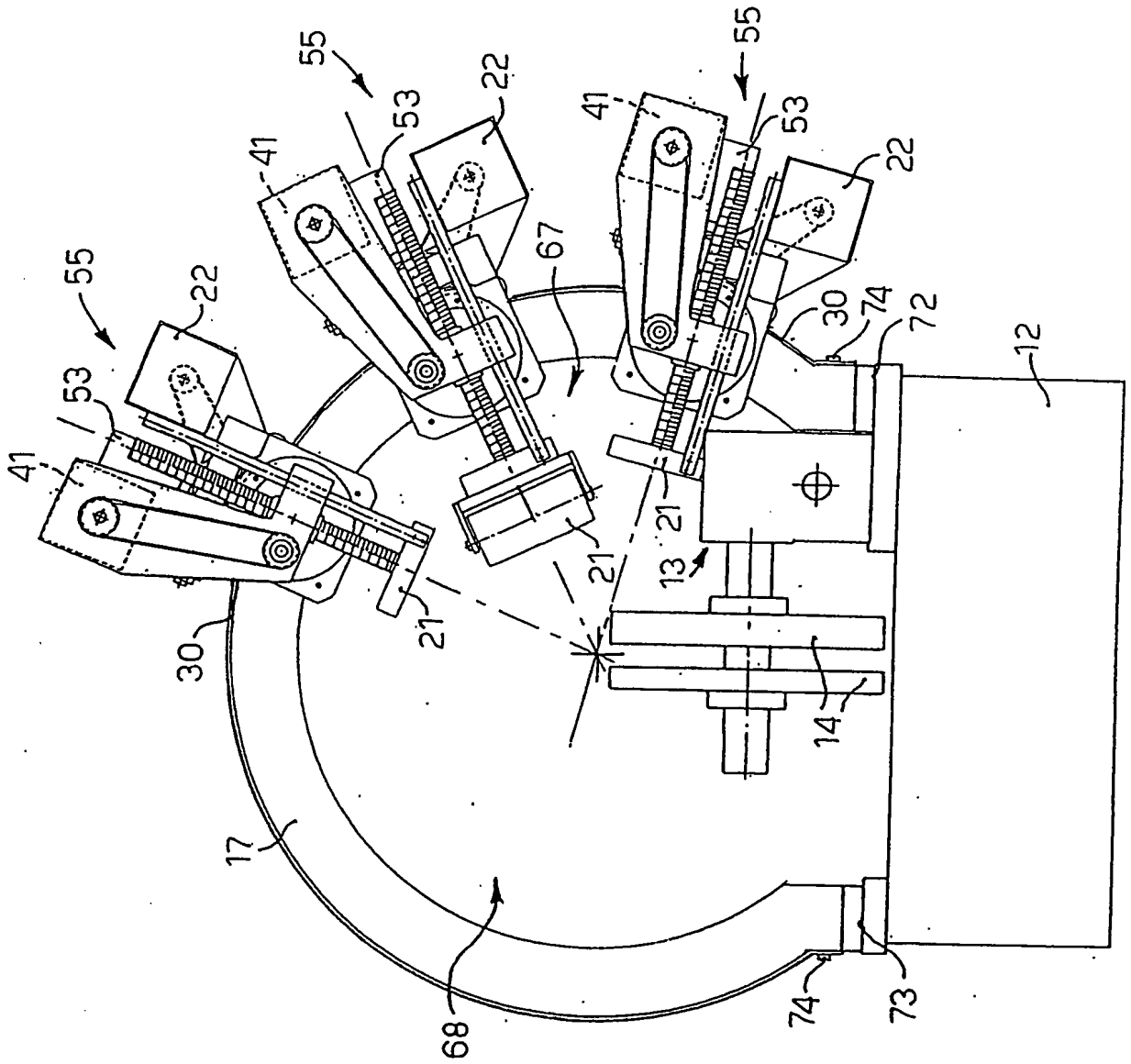

fig. 7

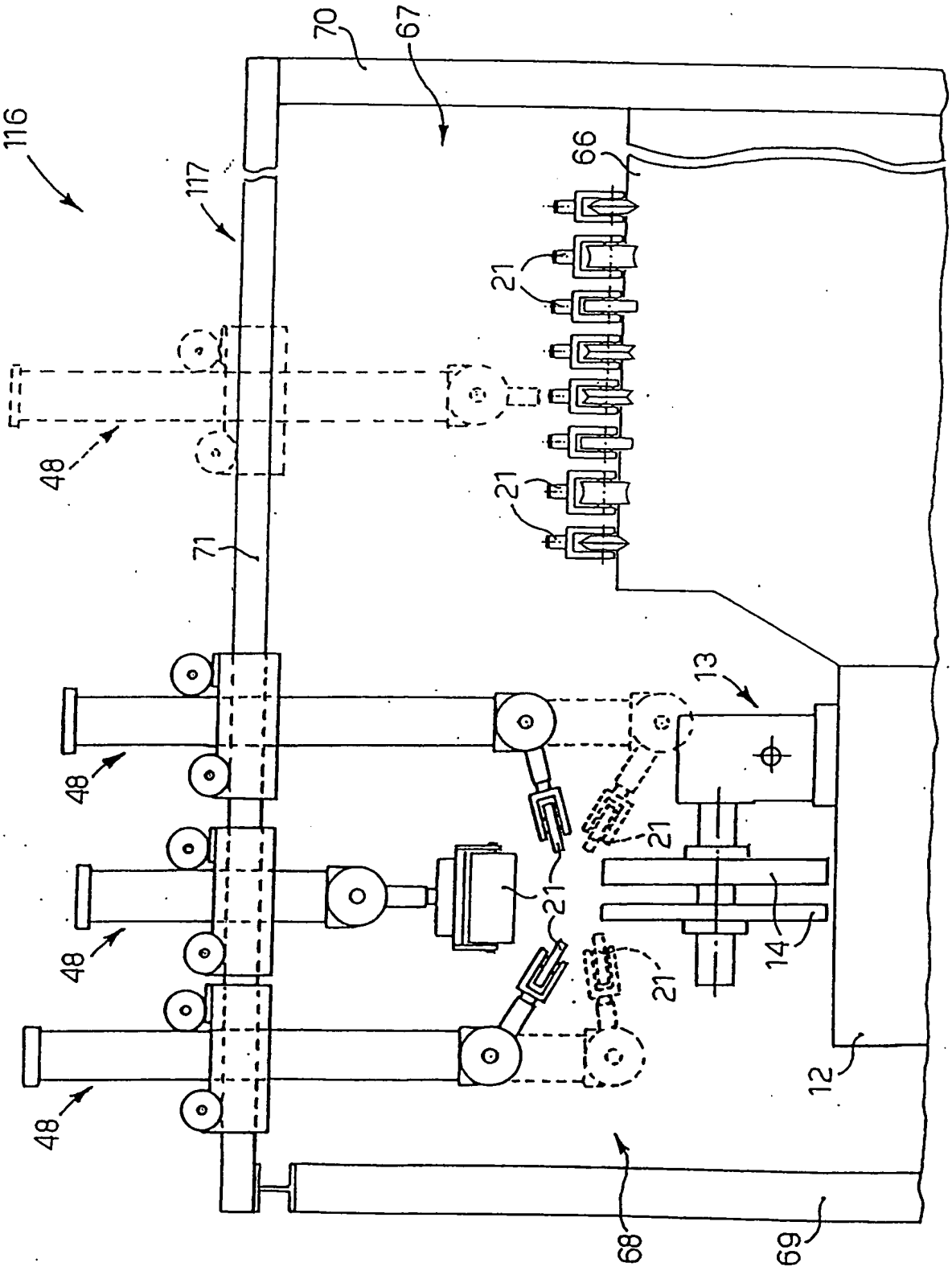

fig. 8

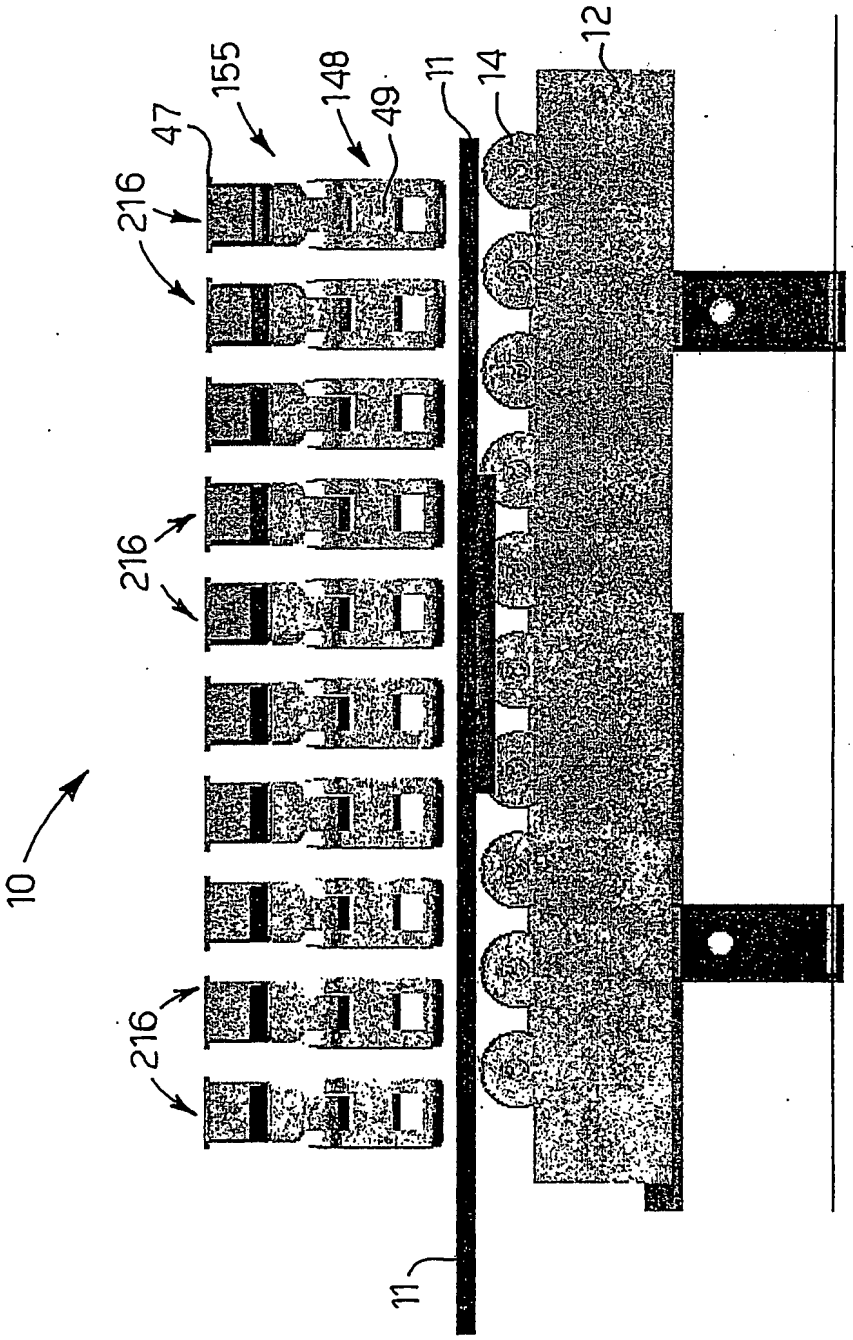

fig. 9

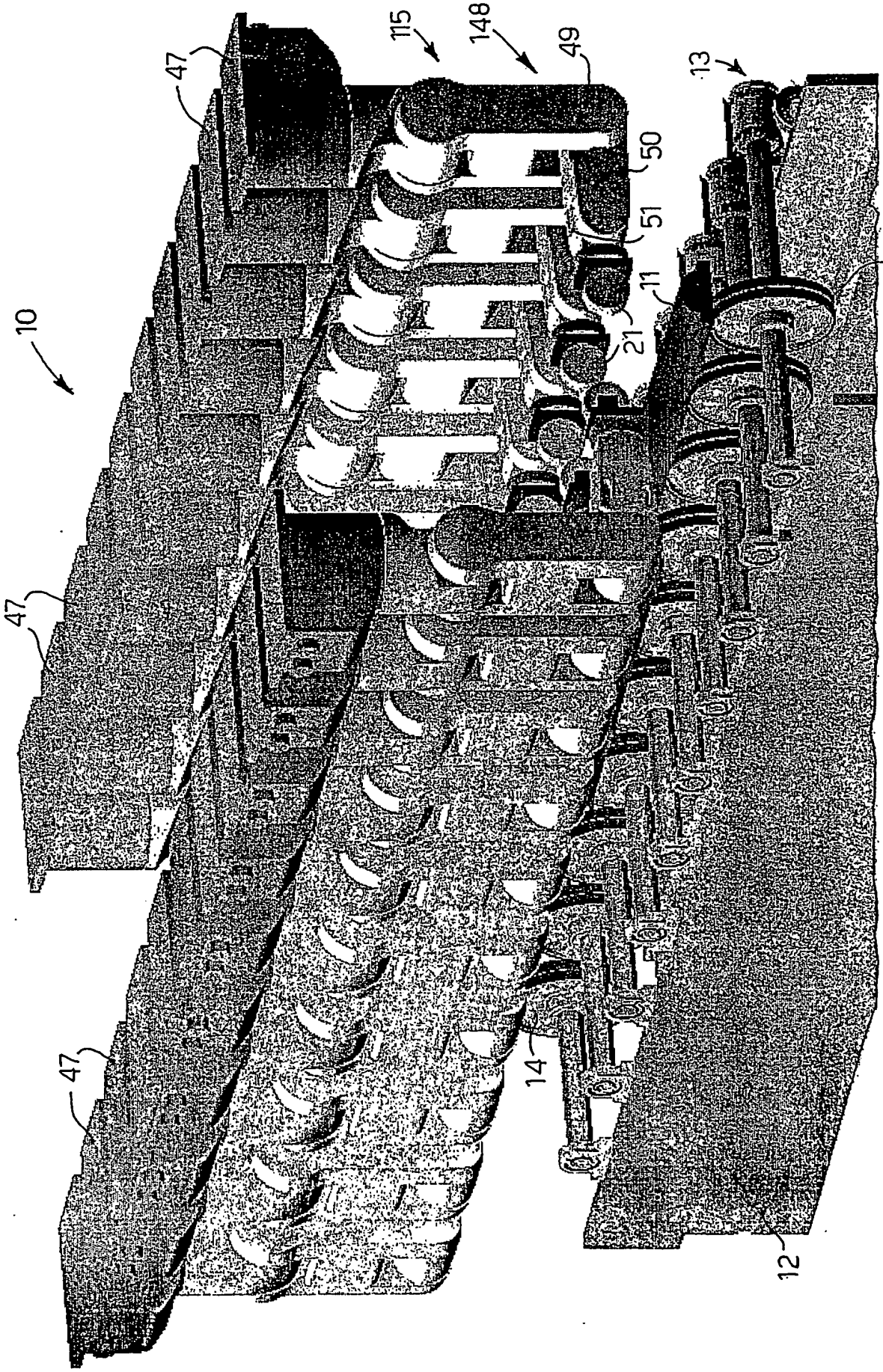

fig. 10

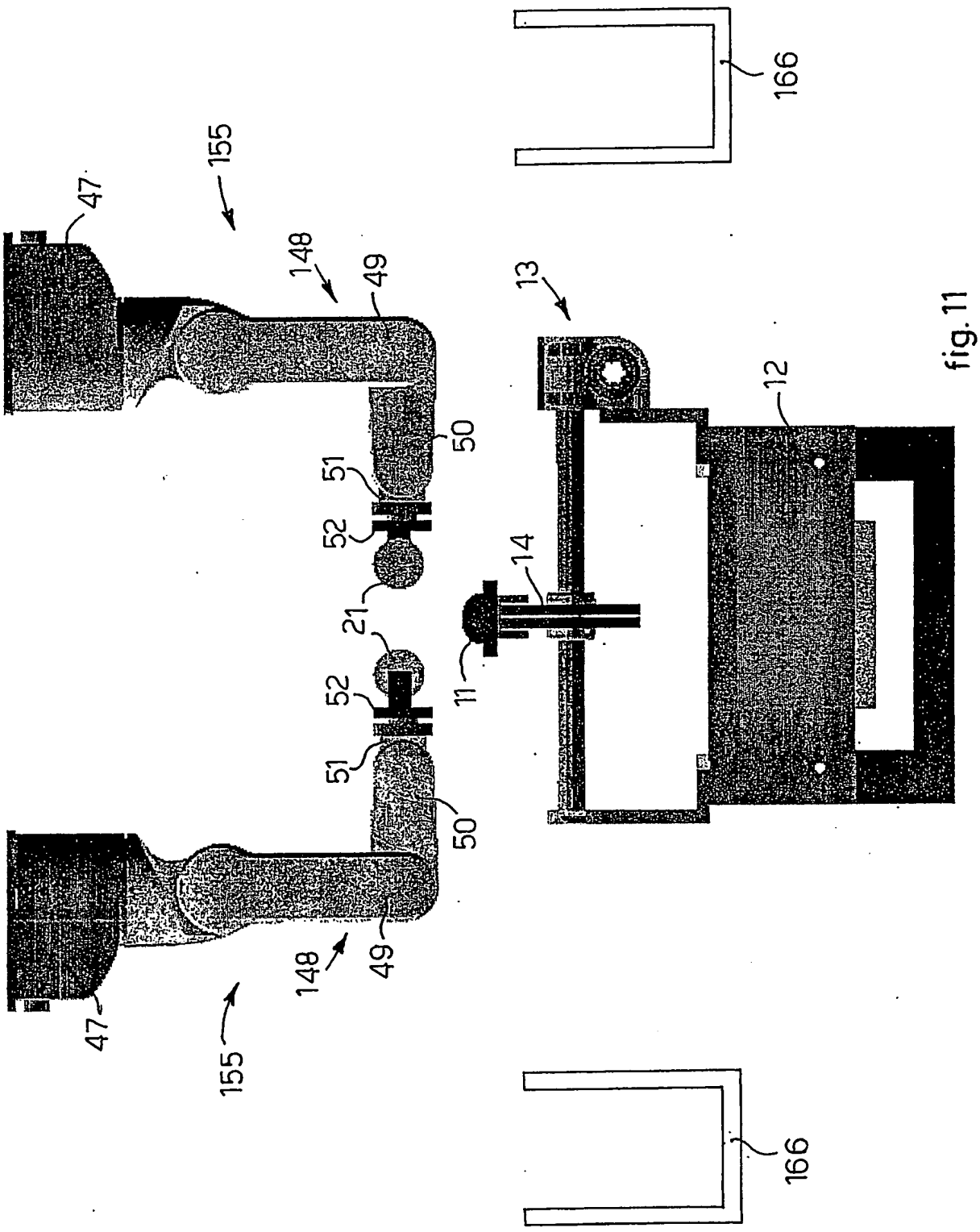
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fig.11

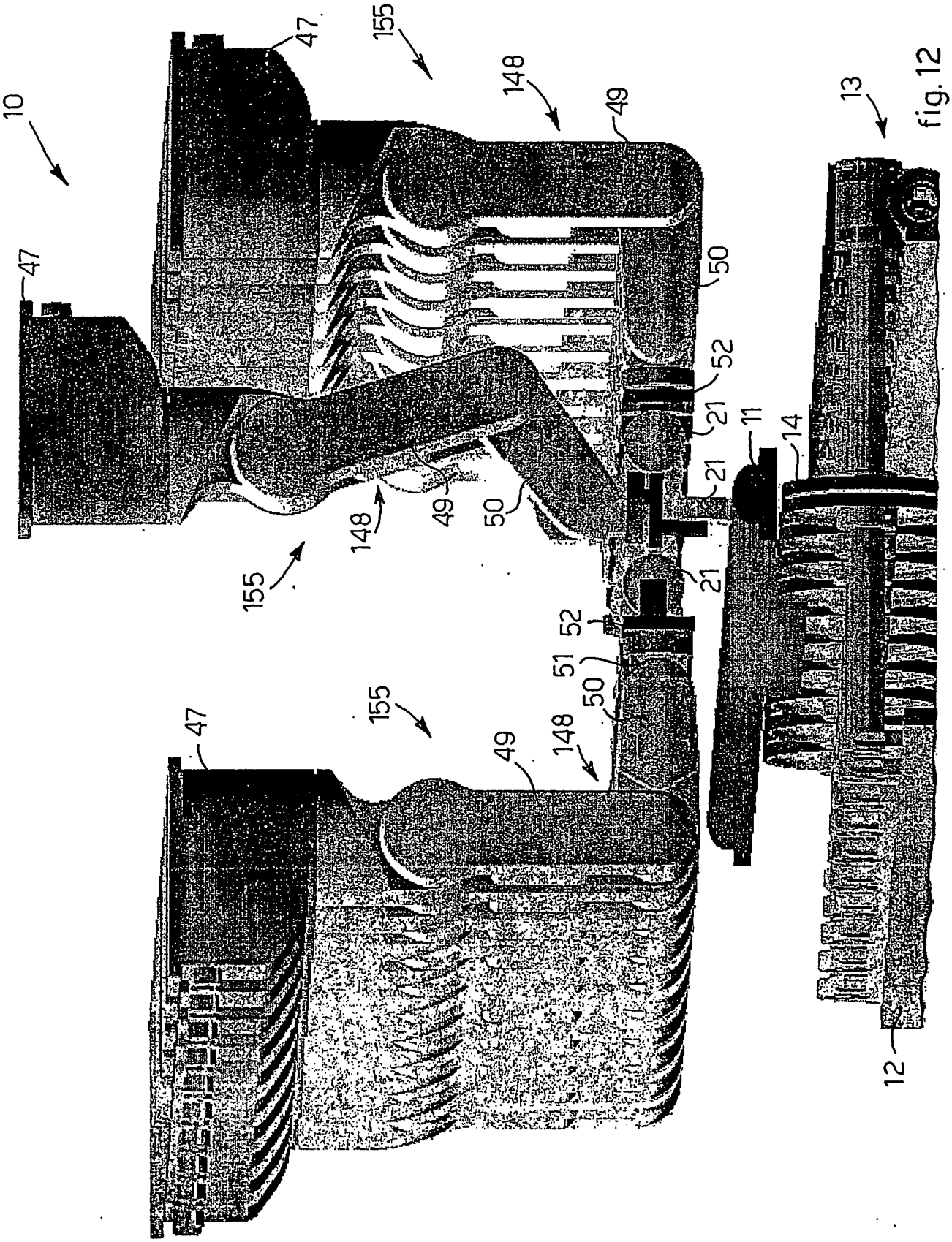

fig. 12

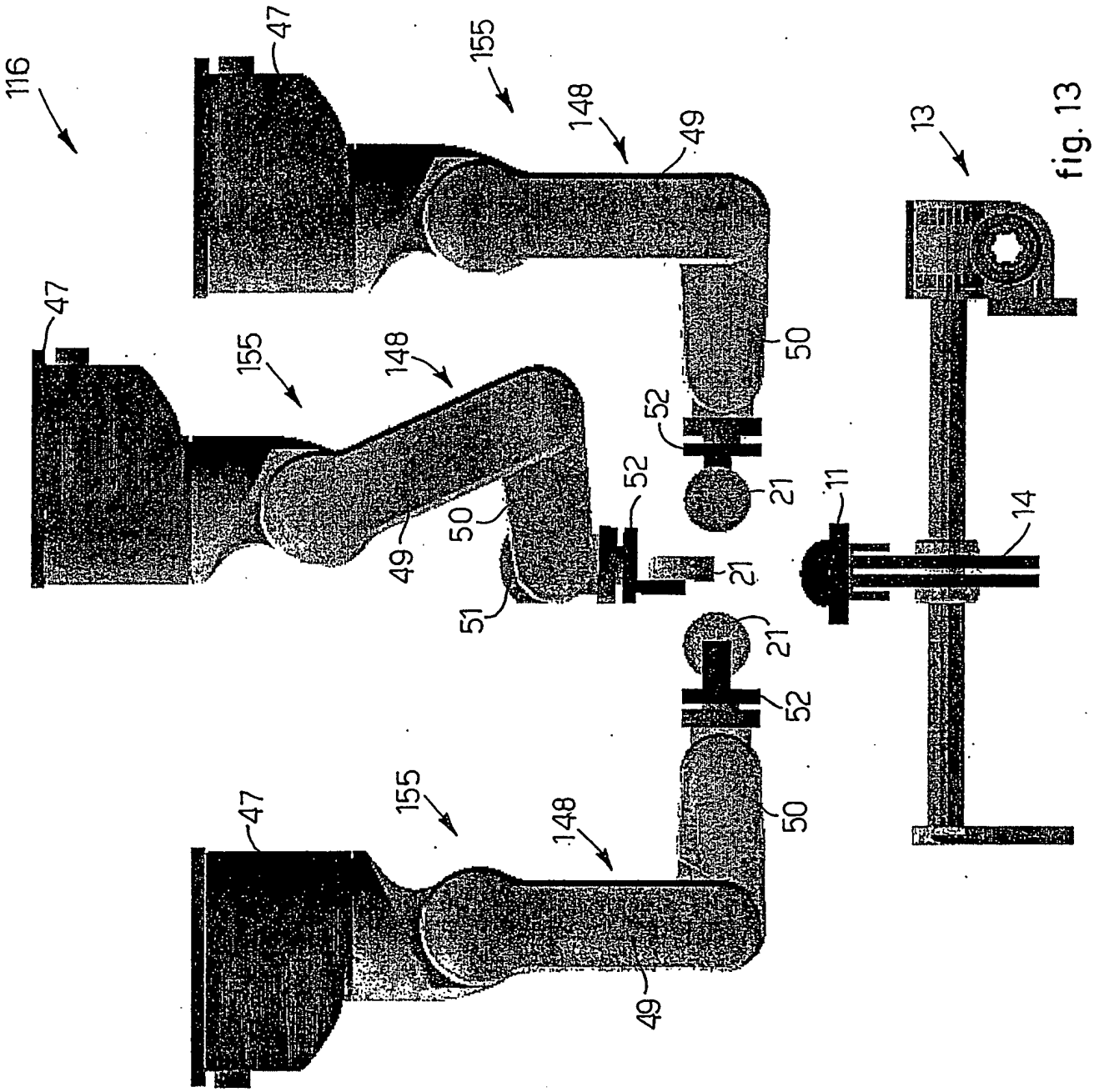

fig. 13

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B29C63/04 B27D5/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B29C B27D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 299 18 968 U1 (FRIZ MASCHINENBAU GMBH) 6 April 2000 (2000-04-06) page 4, line 4 - line 25 page 8, paragraph 2 page 15, paragraph 2 page 16, last paragraph - page 17, paragraph 1 page 19, paragraph 2 - paragraph 3 figures 1,2	1,3, 13-16
Y		2,4-12, 17
Y	DE 200 06 623 U1 (MHF GMBH) 3 August 2000 (2000-08-03) figure 1	2

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
18 February 2005	28/02/2005

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Lanaspeze, J

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 997 260 A (FRITZ ROBERING GMBH & CO. KG) 3 May 2000 (2000-05-03) paragraph '0038! - paragraph '0039! figure 1	4-12
Y	EP 1 155 793 A (WESSEL, KARL-HEINZ; MANTELPROFILWERK BERG GMBH) 21 November 2001 (2001-11-21) figures 1,4	17

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